Claims

1. A catalyst system for the polymerization of α-olefins, the catalyst being prepared by a process including a catalyst activation comprising the contacting of a solid transition metal compound with an organoaluminium compound, and a catalyst prepolymerization comprising the polymerization of a premonomer in the presence of the activated catalyst, **characterized** in that the catalyst activation comprises a first step of contacting the solid transition metal compound with a first organoaluminium compound in the presence of an oil to give a first reaction mixture, and a second step of contacting the first reaction mixture with a second organoaluminium compound to give a second reaction mixture, the second organoaluminium compound being the same as or different from the first organoaluminium compound.

2. A catalyst system according to claim 1, **characterized** in that in said first step, a mixture consisting essentially of said solid transition metal catalyst component and said oil is preactivated with said first organoaluminium compound.

3. A catalyst system according to claim 1 or 2, **characterized** in that in said first step, the weight ratio between said solid transition metal compound and said oil is between 0.1 and 5, preferably between 0.2 and 1, most preferably between 0.3 and 0.8.

4. A catalyst system according to claim 2 or 3, **characterized** in that in said first step, said mixture consisting essentially of said solid transition metal compound and said oil has been prepared by heating them together at an elevated temperature, preferably at a temperature between about 26 °C and about 100 °C, most preferably at a temperature between about 30 °C and about 80 °C.

5. A catalyst system according to any preceding claim, **characterized** in that in said first step, said solid transition metal compound, said organoaluminium compound and said oil are precontacted at a lowered temperature, preferably at a temperature between about -20 °C and about +20 °C, most preferably at a temperature between about 0 °C and about +16 °C.

6. A catalyst system according to any preceding claim, **characterized** in that in said first step, said organoaluminium compund (Al_1) and said solid transition metal (Tr) compound are contacted in the presence of said at least a part of the oil in an atomic ratio Al_1/Tr of between about 0.5 and about 5, preferably between about 1 and about 3.

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7. A catalyst system according any preceding to claim, **characterized** in that in said first step, said first reaction mixture is further contacted with a wax, fat, solid paraffin or the like to give a waxed first reaction mixture.

8. A catalyst system according to claim 7, **characterized** in that in said first step, said wax, fat, solid paraffin or the like is added at higher temperature than its melting point.

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9. A catalyst system according to any preceding claim, **characterized** in that in said second step, said first reaction mixture or said waxed first reaction mixture is further activated with said second organoaluminium compound.

10. A catalyst system according to claim 9, **characterized** in that in said second step, said first reaction mixture or said waxed first reaction mixture is contacted with an external electron donor.

11. A catalyst system according to any of claims 7 to 10, **characterized** in that the weight ratio between the total amount of said oil and the total amount of said wax, fat, solid paraffin or the like is such that the viscosity of their mixture at 20-25 °C is about 1 Pa·s to about 15 Pa·s, preferably about 4 Pa·s to about 10 Pa·s.

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12. A catalyst system according to any preceding claim, **characterized** in that the atomic ratio between the aluminium (Al_1) of said first organoaluminium compound and the aluminium (Al_2) of said second organoaluminium compound Al_1/Al_2 is between about 0.001 and about 1, preferably between about 0.01 and about 0.1.

13. A catalyst system according to any preceding claim, **characterized** in that the atomic ratio between the aluminium (Al) of the total amount of organoaluminium compound and the transition metal (Tr) of the solid transition metal compound Al/Tr is between about 10 and about 1000, preferably between about 50 and about 500.

14. A catalyst system according to any preceding claim, **characterized** in that said solid transition metal compound has been prepared by contacting at least magnesium dichloride or a complex thereof, titanium tetrachloride and an internal electron donor.

15. A catalyst system according to any preceding claim, **characterized** in that said first organoaluminium compound has the formula (1):

$$R_{3m-n}Al_mX_n \qquad (1)$$

wherein R is a C_1-C_{12} alkyl, X is a halogen, m is 1 or 2 and $0 \leq n \leq (3m-1)$, and preferably is a trialkyl aluminium, most preferably triethyl aluminium TEA.

16. A catalyst system according to any preceding claim, **characterized** in that said second organoaluminium compound is the same as said first organoaluminium compound.

17. A catalyst system according to any preceding claims, **characterized** in that in the prepolymerization, the premonomer is polymerized in the presence of at least said second reaction mixture to give a prepolymerizate.

18. A catalyst system according to any preceding claim, **characterized** in that in the prepolymerization, the atomic ratio Al_{1+2}/Tr between, on one hand, the aluminium (Al_2) of said second organoaluminium compound and the aluminium (Al_1) of first organoaluminium compund taken together, and, on the other hand, the transition metal (Tr) if said solid transition metal compound, is from about 1 to about 10, preferably from about 3 to about 8.

19. A catalyst system according to any preceding claim, **characterized** in that in the prepolymerization, the amount of said olefin premonomer is such that the obtained weight ratio between the prepolymer obtained therefrom and said solid transition metal catalyst compound is between 1 and 10, preferably between 1 and 5.

20. A catalyst system according to any preceding claim, **characterized** in that in the prepolymerization, said olefin premonomer is ethene.

21. A process for the polymerization of an olefin, **characterized** in that an α-olefin is contacted with a catalyst system according to any of claims 1-20.

22. A process according to claim 21, **characterized** in that said α-olefin is a C_3-C_6-α-olefin or a mixture thereof, preferably propene or a mixture of propene and less than 20% by weight of ethene.

23. A process according to claim 21 or 22, **characterized** in that said α-olefin is copolymerized with another α-olefin monomer or ethene.

24. A process according to claim 21, 22 or 23, **characterized** in that the olefin is contacted with a third organoaluminium compound.

25. A process according to claim 24, **characterized** in that the third organo-aluminium compound is the same as said first and/or second organoaluminium compound.

26. A process according to claim 24 or 25, **characterized** in that the total amount of aluminium (Al) is such that the atomic ratio Al/Tr is 40-1000, preferably about 50 to about 500.

27. A process according to any of claims 21 to 26, **characterized** in that hydrogen is contacted with said catalyst system and said olefin under polymerization conditions, preferably in an amount giving propylene polymer having a melt flow rate MFR_2 of between 0.3 g/10 min and 2000 g/10 min, more preferably 0.3-1000 g/10 min, most preferably between 1.0 g/10 min and 400 g/10 min.